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THE CONSEQUENCES OF METRIC CONVERSION FOR SMALL MANUFACTURERS. --ETC(U)

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JF COATES INC.

THE CONSEQUENCES OF METRIC CONVERSION FOR SMALL MANUFACTURERS

Volume 1

SUMMARY REPORT

Henry H. Hitchcock

Joseph F. Coates

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they serve. Metric production is considered by small manufacturers as a routine aspect of doing business.



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PREFACE

The metric system of measurement is working its way into all aspects of American life: sports, schools, health care, gasoline pumps, wine and liquor, manufacturing, weather reports, and soft drink bottles. The U.S. Metric Board was established as an agency of government to assist individuals, groups, governments, companies, and others who voluntarily choose to convert to using the metric system. One of their missions is research on how conversion to metric occurs and what its effects are on those who convert and on the nation.

Over the last decade, controversy, concern, and conjecture have surrounded the effects of metric conversion on small businesses. Enthusiasts for metric argue that conversion would benefit small businesses in two ways. It would expand their markets -- especially export markets. It would also improve business by making production processes more rational. Dissenters argue that conversion is unnecessary and possibly harmful to the majority of the nation's small businesses. Against this backdrop, the U.S. Metric Board is fulfilling its statutory mission to find out what happens to small businesses that convert to metric.

The first phase of the project was a search for small businesses that had made substantial investments in converting to metric.* That search showed that small businesses were most likely to invest in metric production in response to large corporations' needs for metric parts and products. The second phase of the research consisted of three case studies of the effects of large companies' conversion on small business suppliers. The team studied how the conversion of a General Electric Company department, two Ford Motor Company product lines, and three divisions of Ingersoll-Rand affected their small business suppliers.

This is the first volume of a two volume report. Volume I summarizes the findings of both phases of the research. Volume II reports the details of the phase two case studies.

*Henry Hitchcock and Joseph Coates, The Search for Small Businesses with Investments in Metric Production. (Washington, D.C.: J.F. Coates, Inc., June 1981) NTIS #AD-A 107-860.

At the U.S. Metric Board, Gene Visco, Ed McEvoy, and Stan Parent were attentive, interested, and involved patrons. At J.F. Coates, Inc., Marcy Canavan, Grant Prillaman, and M. Suzanne Nettles assisted in the case studies which are summarized here. Rhoda Baum was responsible for producing this report. Bernice Mann and Barbara Bullard helped her.

This report was prepared for the U.S. Metric Board under Contract Number AA-80-SAC-X8604. Any opinions, findings, conclusions, or recommendations expressed in the report are those of the authors and do not necessarily represent the views of the U.S. Metric Board, the General Electric Company, Ford Motor Company, or Ingersoll-Rand Company.

VOLUME I
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ABSTRACT

The capability to make metric products is widespread among America's small manufacturers. This capability costs little and is spurred by demands of current customers -- especially large corporations. Small manufacturers handle metric orders flexibly in terms of methods of production, manufacturing practices, financial arrangements, and work assignments. Metric production presents few problems for small manufacturers; the problems that arise are transitory. Small manufacturers have not benefited from metric conversion except to keep the business of their customers that convert to metric. Small manufacturers see their decision to convert as neither a voluntary search for new business nor a decision forced upon them by a customer. They follow the general trends in the industries they serve. Overall, metric production is a routine aspect of doing business -- especially with large corporations.

This abstract, summarized in Exhibit 1, comes from a two phased research project on the effects of metric conversion on small businesses. The first phase involved a search for small businesses making substantial investments in metric production. The second phase consisted of three case studies of the interaction of large and small businesses on metric production. The following sections describe the purpose of the project, the approach, and the findings of the two phases. The exhibits summarize the text; for a quick reading of the project results, the exhibits may be enough.

ABSTRACT

SMALL BUSINESS PRODUCTION TO METRIC DIMENSIONS IS:

- WIDESPREAD
- IN RESPONSE TO CURRENT CUSTOMER DEMANDS
-- ESPECIALLY LARGE CUSTOMERS
- INEXPENSIVE
- HANDLED FLEXIBLY
- NO PROBLEM
- NO BENEFIT
- NEITHER VOLUNTARY NOR FORCED
- A ROUTINE ASPECT OF DOING BUSINESS WITH LARGE COMPANIES

PROJECT PURPOSE

The purpose of this research is to illuminate the policy discussion surrounding the effects of metric conversion on small businesses. (See Exhibit 2.) A previous survey of 1,100 small businesses around the country concluded that a modest but significant amount of metric production had been developed with few problems as a result of demands from the firm's customers or suppliers.*

Where this previous survey yielded atomic or highly discrete data on the state of metric conversion, the present research is intended to provide integrated holistic accounts of conversion experiences. The goal is an assessment of the costs and benefits of small businesses' conversion to metric production.

*Damans and Associates, Survey of Small Businesses: Issues in Metric Conversion and Planning. Prepared for the U.S. Metric Board, December, 1980.

- | | |
|----------------------|--|
| ● PROJECT PURPOSE | Illuminate the policy discussion concerning the effects of metric conversion on small businesses. |
| ● PROJECT OBJECTIVES | Detailed understanding of the costs, benefits, problems, and opportunities encountered by small businesses converting to metric.

Provide information on the interaction of large and small businesses on metric production. |
| ● PROJECT PLAN | Detailed description of the experiences of small manufacturers making metric products. |

The research looks only at hard metric conversions, that is products made to metric dimensions.

PHASE 1: THE SEARCH

To describe the effects of conversion on small businesses, the research attempted to identify and analyze the experiences of clusters of small businesses. These clusters would consist of:

- a relatively large-sized small business which has undergone hard metrication, and which was not previously involved in metric-related activities, e.g., not a scientific instrument supplier;
- from the suppliers to that company, a small business impacted by the hard metrication;
- on the output side, customers of the company potentially or in fact impacted by hard metrication.

To find these clusters of small businesses, the study team began a search for appropriate candidates for study. They looked for businesses with less than 500 employees, independent businesses -- not affiliates of large corporations. They also looked for businesses making hard metric products -- manufacturers. The study did not look at wholesale, retail, transportation, or construction firms. The team wanted businesses that had converted to metric, not those who had always been working in metric. (See Exhibit 3.)

Exhibit 3

WHAT THE STUDY TEAM LOOKED FOR

- SMALL
 - Fewer than 500 employees
- INDEPENDENT
 - Not a subsidiary
 - Not an affiliate
- HARD METRIC PRODUCT
 - Manufacturers
 - Not retail, wholesale, construction
- CONVERTED
 - Not metric companies that have always produced metric products
- SUBSTANTIAL INVESTMENT
 - OVER \$10,000
 - Two selection rules
 - Shown by previous research to be a good discriminator
- CONSIDERED SIGNIFICANT
 - The most important criterion

Most importantly, the team was interested in companies making substantial investments in producing metric products. Two criteria determined substantial investment. First, was the investment in metric production over \$10,000? Preliminary research indicated this was a good threshold. Second, and most important, did the company itself consider the investment in metric production a significant one for the company?

The search failed to identify clusters of small businesses to analyze. It did lead to an interesting description of small businesses' experience with metric conversion.

PHASE 2: THE CASE STUDIES:

The search for small businesses with substantial investments in metric production revealed a widespread but shallow metric capability purchased at low cost in response to large customers' demands. The search also indicated small businesses were most likely to make substantial investments in converting to metric in response to demands from large corporate customers. With the concurrence of the U.S. Metric Board, in phase 2 the study team did three case studies of small business-large business interaction on metric conversion to (a) locate small businesses making substantial investments in converting to metric, and (b) extend understanding of this critical facet of small business conversion.

The team chose the case studies approach for five reasons. (See Exhibit 4.) First, the search findings showed large businesses tend to drive small business conversion to metric. Second, if there is going to be a substantial investment in metric conversion on the part of small businesses, it is most likely in their response to the large demands placed on them by large businesses. Third, if small businesses are stressed by metric production, it is most likely to be in response to large businesses' demand for metric products. Fourth, the interaction of large and small business on metric production has not been addressed. Fifth, addressing the interaction of large and small businesses on metric conversion could provide lessons for other companies, other industries, and public agencies as they consider conversion.

WHY CASE STUDIES?

- | | |
|----------------------------------|---|
| • LARGE DRIVE SMALL | Previous research indicates that small businesses convert in response to demands from large corporations for metric. |
| • LIKELY SUBSTANTIAL INVESTMENTS | Big companies' large demands for metric are most likely to lead small businesses to make substantial investments in metric production. |
| • LIKELY STRESS | If small businesses are stressed by metric conversion, it is most likely to occur as the result of demands for metric from big companies. |
| • NOT ADDRESSED | The interaction of large and small businesses on metric production has not been addressed in previous research. |
| • LESSONS | The experience of large businesses and small businesses in metric production may have lessons for other companies, industries, or public agencies contemplating conversion. |

Based on the previous search for small businesses converting to metric, consultations with informed observers, the literature on metric, and referrals from other large companies, the study team identified 25 candidate large companies for case studies. The team contacted these 25 companies and discussed the possibility of a case study. Based on these discussions, the study team and the U.S. Metric Board staff developed the following selection criteria:

- willing to cooperate
- completed conversion
- significant amount of conversion
- numerous small business suppliers
- market related conversion
- diverse small business suppliers
- not studied before by the U.S. Metric Board
- credible
- interesting
- generalizable

Using these criteria, the team and the Metric Board staff selected three large companies for case studies -- a multi-national consumer products company, a diversified machinery manufacturer, and a large vehicle manufacturer. (See Exhibit 5.)

THE THREE CASE STUDIES

Exhibit 5

- HOW SELECTED
 - Systematic selection involving USMB Staff, Board members, and experts' judgment.
 - 11 criteria including:
 - Willingness to cooperate
 - Completed conversion
 - Significant amount of metric production
 - Large number of suppliers
 - Diverse types of suppliers.
- WHO SELECTED
 - GENERAL ELECTRIC COMPANY
DATA COMMUNICATIONS
PRODUCTS BUSINESS DEPT.
 - Make high-speed printers
 - Metric since 1978
 - FORD MOTOR COMPANY

LIGHT TRUCKS
ESCORT/LYNX
 - Metric increasing for the past several years
 - The two most full metric products
Escort/Lynx = 93% metric
 - INGERSOLL-RAND
IMPCO DIVISION
PORTABLE COMPRESSOR
DIVISION
POWER TOOL DIVISION
ROANOKE FACILITY
 - Corporate metric decision in 1975
 - Different divisions approach
conversion differently

The first case study was the General Electric Company's Data Communications Products Business Department in Waynesboro, Virginia. They make a metric high speed printer used with computers and telecommunications equipment. Second, the team studied Ford Motor Company's light truck and Ford Escort/Mercury Lynx production. The 1981 Escort/Lynx was 93 percent metric. Third, the team looked at three divisions of the Ingersoll-Rand Company: the IMPCO

Division which makes large production machinery for the wood pulp and paper industry; Portable Compressor Division which makes the portable air compressors; and Power Tool Division's Roanoke facility which makes air starters, hoists, and winches.

Each case study involved the large business, its small business suppliers, and (to a lesser degree) its small business customers or service organizations. In looking at these different actors, the case studies looked at two questions (see Exhibit 6):

- How has the large company's conversion affected its small business suppliers and customers?
- How have considerations of small businesses' ability to provide metric products affected the way the large company has converted to metric?

Exhibit 6

WHAT THE TEAM WANTED TO KNOW

- EFFECTS OF CONVERSION ON SMALL BUSINESS
- INTERACTIONS AMONG LARGE AND SMALL BUSINESSES ON METRIC PRODUCTION



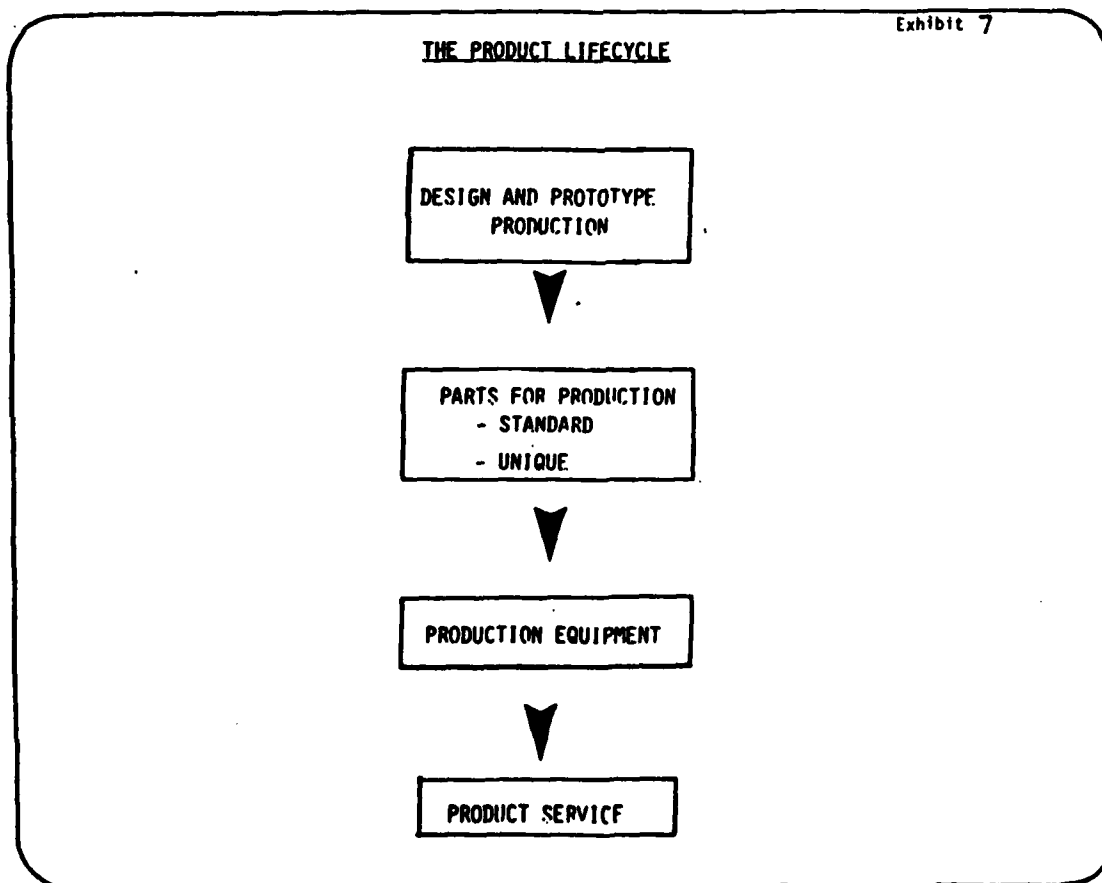
THE PRODUCT LIFECYCLE

THE PRODUCT LIFECYCLE: AN ORGANIZING FRAMEWORK

To identify the different ways small businesses interact with large businesses, the case studies looked for suppliers at each stage of the product lifecycle. The product lifecycle relates how manufacturing occurs in the large corporations to its internal departments, and, in turn, how the departments relate to suppliers. Emphasizing the product lifecycle illustrates the complexity and diversity of the relationships between large and small manufacturers. That complexity underlines the significance of the straightforward, simple findings presented below.

From discussions with the large companies, the team identified four basic stages in the product lifecycle. (See Exhibit 7.)

- Prototypes: In the engineering and design phase of the product lifecycle, models or prototypes are built to test the concept. These require parts from external suppliers.

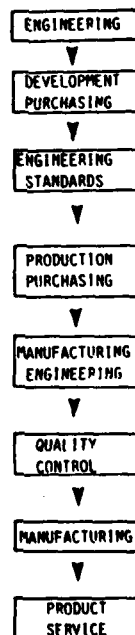


- Parts for production: When a product goes into production, a large company needs parts and sub-assemblies from external suppliers. They may go to outside companies because they are not equipped to make the product; the supplier makes a better product; the supplier makes a cheaper product; or they do not have any available production capacity. The large company may purchase standard items such as nuts and bolts or custom parts such as stampings or plastic molded parts.
- Production equipment: Large companies may turn to small businesses for modifications of existing production equipment or for new equipment such as taps, drills, digital dual readouts, milling machines, lathes, drill presses, inspection equipment.
- Product service: Small business may be involved in modifying, rebuilding, or servicing the products of large businesses -- for example, the service station that works on a metric Ford.

Each stage of the product lifecycle involves different departments.
(See Exhibit 8.) In each of the three large companies, some form

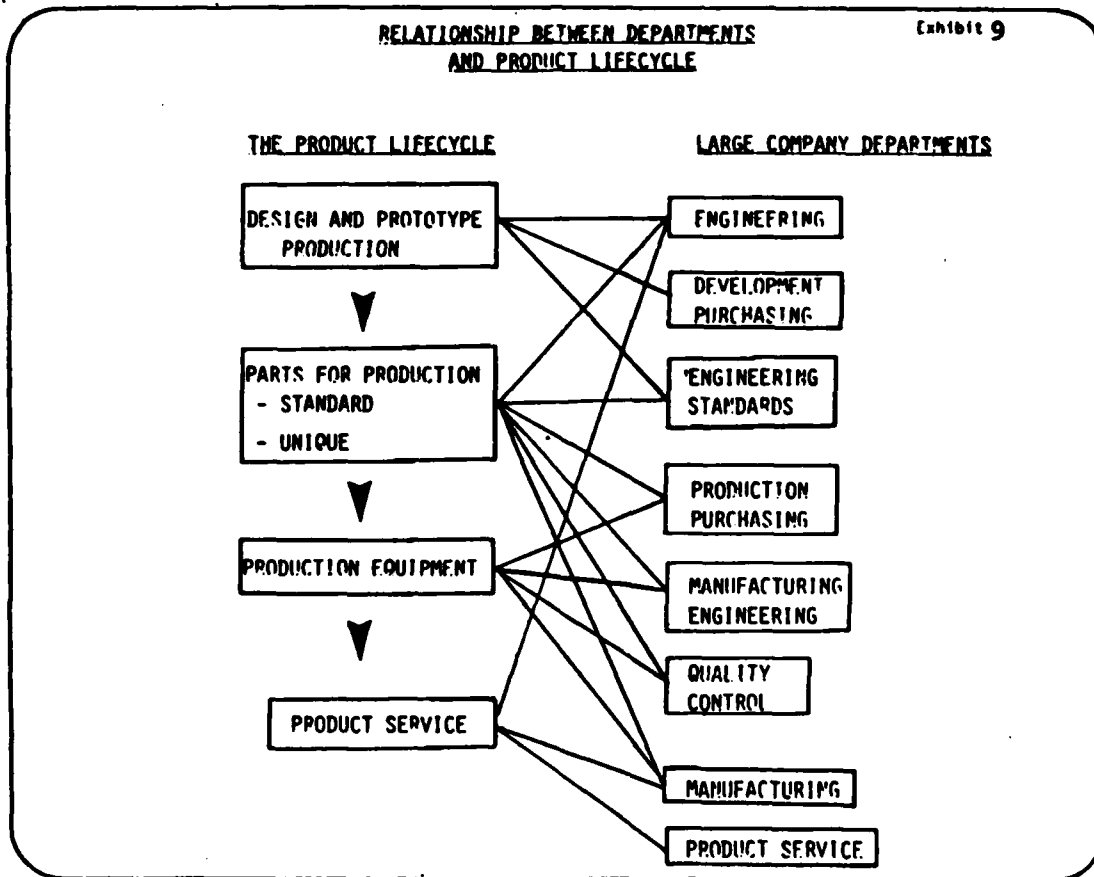
Exhibit 8

LARGE COMPANY DEPARTMENTS:
A GENERALIZED ORGANIZATIONAL STRUCTURE



of these eight departments are involved. Engineering designs and builds the prototypes. Development Purchasing buys the prototype parts. Engineering Standards promulgates standards for development and full scale production. Production Purchasing buys the parts for the full scale production. Manufacturing Engineering plans and organizes production. Quality Control makes sure parts made in-house and by suppliers meet specifications. Manufacturing makes parts and puts the product together. Product Service deals with service and repair of the product.

As Exhibit 9 illustrates, no one department is solely responsible for any stage in the product lifecycle.



For example, in the design and prototype development, Engineering, Development Purchasing, and Engineering Standards all have roles. In product service, Manufacturing may make spare parts. Engineering may get involved because of claims resulting from warranty work.

Suppliers are involved throughout this product lifecycle. Exhibit 10 lists five different kinds of suppliers involved in the product lifecycle: small machine shops; standard parts manufacturers (such as fastener manufacturers); manufacturers of custom parts (metal stampers, plastic molders, rubber parts manufacturers); equipment manufacturers (companies making gauges, instruments, machine tools), and service organizations (including customers, independent service organizations, or distributors).

Exhibit 10

TYPES OF SUPPLIERS OF METRIC PRODUCTS

SMALL MACHINE
SHOPS

- Prototype suppliers
- Metal stampers

STANDARD PARTS
MANUFACTURERS

- Bolt manufacturers
- Screw manufacturers
- Nut manufacturers

MANUFACTURERS
OF CUSTOM PARTS

- Plastic molders
- Metal stampers

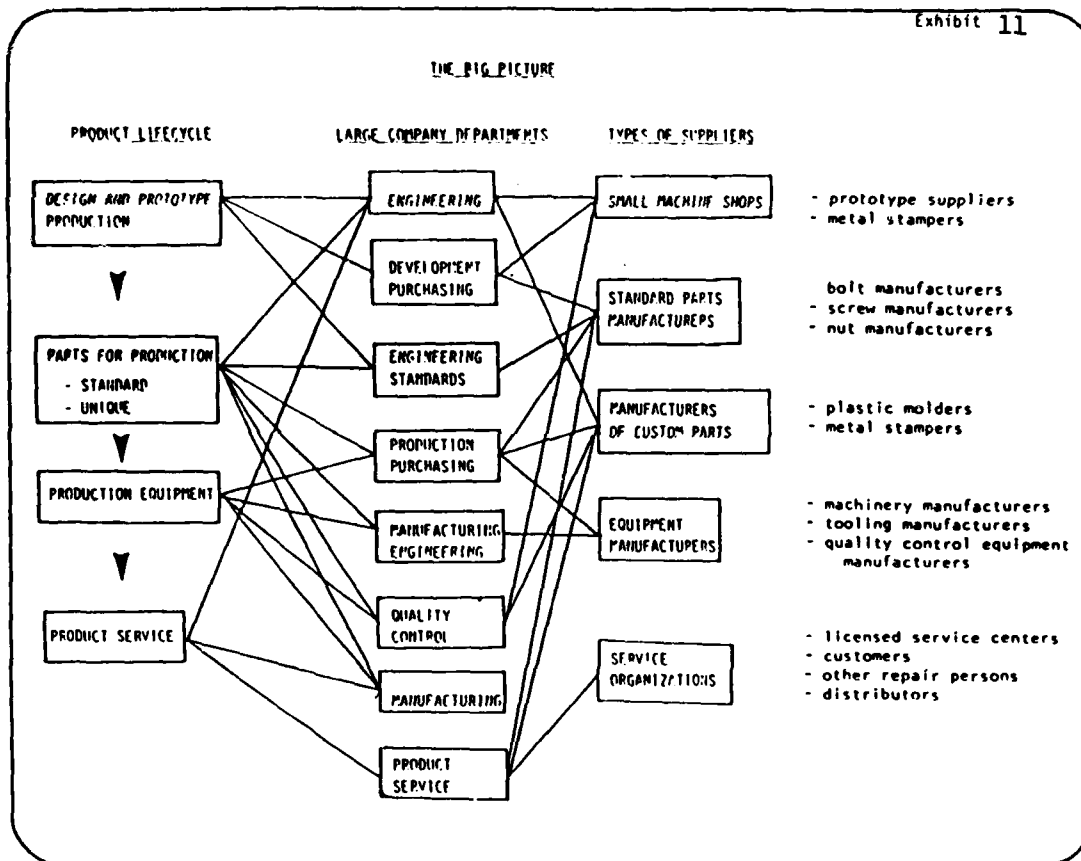
EQUIPMENT MANUFACTURERS

- Machinery manufacturers
- Tooling manufacturers
- Quality control equipment
manufacturers

SERVICE ORGANIZATIONS

- Licensed service centers
- Customers
- Other repair persons
- Distributors

Exhibit 11 is the big picture of relations among suppliers and the large company along the stages of the product lifecycle. There is no one type of relationship between suppliers and the large company. There are many paths small businesses follow in working with large companies to produce products. The case studies covered all these paths in order to describe the consequences of conversion for all the different kinds of suppliers.



WHAT THE TEAM DID

The first phase of the research looked for small businesses making substantial investments in metric production. (See Exhibit 12.) The team began by following leads from the trade press, metric literature, previous research, and the advice of experts in the field. Later, they

WHAT THE TEAM DID
IN PHASE 1 SEARCH

- Initial Search following leads from:
 - literature
 - experts
 - other companies
- Extensive Searches of Manufacturers:
 - Pennsylvania
 - Maryland
- Small Business Suppliers to 293 Large Businesses

Resulting in contacts with:

- 868 Small Manufacturers
- 257 Small Metric Manufacturers

made intensive searches of the manufacturers in Pennsylvania and Maryland. The team also turned to large businesses for the names of small businesses supplying them with metric products. These searches resulted in contacts with 868 small manufacturers, of which 30% made metric products. The team also talked with 293 large companies in the search for small business suppliers to large companies.

In phase 2, the team interviewed 42 people in 28 departments of the six divisions of the large companies (see Exhibit 13.) From them, the team got the names of small business suppliers. They then talked to 540 small manufacturers, three quarters of which produce metric products. In addition, the team visited nine small businesses -- seven of which spent over \$10,000 converting to metric; five of those considered that investment significant to their company.

Exhibit 13

WHAT THE TEAM DID
IN PHASE 2 CASE STUDIES

- **INTERVIEWS**
 - 42 people in
 - 28 departments of
 - 6 divisions of
 - 3 large corporations

- **CONTACTS WITH SMALL BUSINESSES**
 - 1240 suppliers' names provided of which
 - 540 are small manufacturers of which
 - 399 are small metric manufacturers
 - Average size, 129 employees
 - Range 2 - 485

- **SITE VISITS TO SMALL BUSINESSES**
 - 9 visits to small metric manufacturers, of which
 - 5 had made substantial investments in metric production

From these interviews, contacts, and visits, the team came to three groups of findings regarding: the business context of metric conversion, the effects of conversion on small metric manufacturers, and relations among large businesses and small businesses concerning metric production (see Exhibit 14).

Exhibit 14

WHAT THE TEAM FOUND

- **BUSINESS CONTEXT**
 - 3 findings

- **EFFECTS ON SMALL METRIC MANUFACTURERS**
 - 4 findings

- **RELATIONS AMONG LARGE AND SMALL BUSINESSES ON METRIC**
 - 3 findings

FINDINGS: THE BUSINESS CONTEXT

Metric conversion occurs in a context of many other business decisions on equipment, customer needs, worker relations, finances, and relations with suppliers. Three findings relate metric production to the day-to-day context of business operations. (See Exhibit 15.)

Exhibit 15

BUSINESS CONTEXT

BUSINESS CONTEXT

Metric conversion occurs in the context of many other business decisions on equipment, customer needs, worker relations, finances, and relations with suppliers and other companies. Three findings relate to the day-to-day business context of metric production.

- TREAT LARGE AND SMALL ALIKE

Large businesses treat large and small businesses alike when seeking metric products.

- DIVISIONS DECIDE

Metric policy is often corporate, but divisions usually decide when, what, and how to convert.

- METRIC IS RARELY PRIMARY

Metric, while often an important consideration, is rarely a primary concern in a manufacturer's business decisions.

First, large businesses do not discriminate among large and small businesses when they go looking for metric products. They want the product -- they usually do not know or care whether the supplier is large or small. When the team asked for lists of small manufacturers, half of the names given were large companies.

Second, in large companies, divisions make the decisions on metric production. For efficiency, large corporations often delegate important production decisions to the division level. Divisions within such

decentralized large companies often act like medium- or small-sized businesses.

While policy on metric is made at the corporate level, the divisions decide when, where, how, and what to convert to metric. Divisions rarely order large quantities of material. They follow market trends in metric availability; seldom do they set such trends. If metric products are not available, they use customary products.

Third, while an important consideration to both large and small businesses, metric is rarely a primary concern in a manufacturer's business decisions. Other decisions, such as recapitalization, industry trends, decisions to move toward more international manufacturing, and decisions to look for international markets drive the decisions to work to metric dimensions.

Competition forces small and large businesses to seek savings in all facets of production; metric is no exception. When converting, large and small businesses convert only what is technically and economically practical and commercially necessary. For example, one of the large companies switched from metric-sized raw materials for which they paid a premium to customary-sized stock. They found it cheaper to machine the customary stock to the metric size. Another firm found the cost of scrap from machining customary sizes into metric sizes too large. They invested in a set of metric dies to reduce the scrap rate. Here, metric investment was an outgrowth of rising steel costs.

With the advent of computer controlled manufacturing and electronic readouts for machines, the costs of conversion to metric have become trivial for most companies.

FINDINGS: EFFECTS ON SMALL METRIC MANUFACTURERS

The search and the three case studies looked for small manufacturers making substantial investments in metric production. From contacts in the two phases with 1,408 small manufacturers*, the team drew four findings.

*The total contacts for both phases: Phase 1: 868 small businesses;
Phase 2: 540 small businesses.

The first finding is a widespread capability to produce metric products. (See Exhibit 16.) Of the 868 small manufacturers contacted in the first phase search, 30% produce metric products. Three-fourths of the 540 small suppliers contacted in the second phase make metric products.

The level of small manufacturers' production depends on the demand from current customers. To the degree customers ask for metric, the small manufacturers produce it.

Second, small manufacturers' investments in metric conversion are routine, insubstantial, and difficult to isolate from other business costs. (See Exhibit 17.) Small manufacturers spend little converting to metric. Of the 656 small metric suppliers contacted in both phases 4% invested over \$10,000 converting to metric and considered the investment significant; another 2% spent over \$10,000 but did not consider the investment significant. Eighty-nine percent made insubstantial investments to make metric products.

Many small manufacturers made no additional investments to produce metric products; they convert metric orders to customary units and use existing machines, tooling, and equipment. Most small manufacturers spent less than \$5,000 on quality control equipment and metric measurement capabilities for new or existing machines.

Whether they made insubstantial or significant investments, all of the small manufacturers felt the costs of metric conversion are insignificant compared to the costs of energy, materials, labor, and other factors of production.

Suppliers are flexible; they use a rich repertoire of management and manufacturing techniques to make metric products (see Exhibit 18). The 370 small metric suppliers contacted in the second phase case studies use different routes to produce metric products.

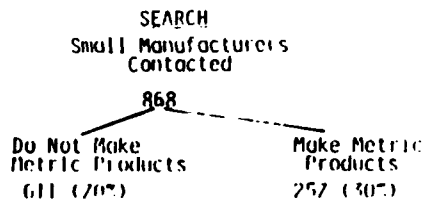
- Half use metric measurements at some stage in the making of metric products.
- An eighth work in customary units but inspect their product in metric.

EFFECTS ON METRIC MANUFACTURERS

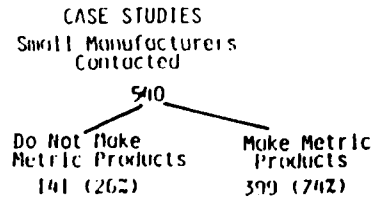
The search and the three case studies looked for small manufacturers making substantial investments in converting to metric. From the experience of 1,608 small manufacturers came four findings:

• WIDESPREAD CAPABILITY;

The capability of small manufacturers to produce to metric dimensions is widespread.



- DEPTH VARIES AS A RESULT OF DEMAND

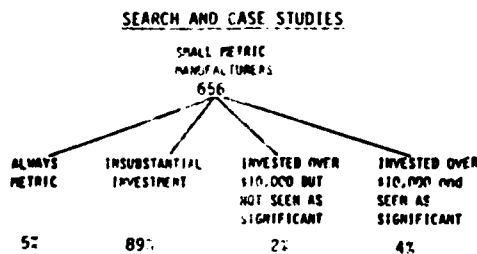


The depth of small manufacturer capability to produce metric products depends directly on the extent of customer demand for metric.

EFFECTS ON METRIC MANUFACTURERS (continued)

• ROUTINE, INSUBSTANTIAL INVESTMENT

Investments in metric are routine, insubstantial, and difficult to isolate from other business costs.



- Many spent nothing
- Of those investing most spent less than \$5000
- Those investing buy quality control equipment and metric capabilities for new machines.

- COSTS RELATIVELY INSIGNIFICANT

The costs of metric production pale in comparison to small businesses' concerns with inflation, energy and material costs, interest rates, and general economic conditions.

EFFECTS ON METRIC MANUFACTURERS (continued)

- FLEXIBLE, USE RICH REPERTOIRE

- METHOD FOR PRODUCING METRIC PRODUCTS

Small manufacturers are flexible. They use a rich repertoire of management and manufacturing techniques to produce metric products.

CASE STUDIES
SMALL METRIC MANUFACTURERS

370

WORK IN
CUSTOMARY
ONLY
188

WORK IN
CUSTOMARY
TEST IN METRIC
46

WORK IN
CUSTOMARY
AND METRIC
91

WORK IN
METRIC
ONLY
45

- WHO HANDLES CONVERSION
- WHERE MEASUREMENTS ARE MADE
- HOW METRIC IS PAID FOR

- A fourth use metric and customary measurements to produce metric products; it depends on who in the shop is making the product.
 - Another eighth of the metric suppliers work only in metric to manufacture their products.
 - The other half work only in customary units -- converting the metric drawings to customary units, and sending it to the customer label in metric units.
- In making a product to metric dimensions:
- Operators may use the dials or gauges on the machine to make the product.
 - Others may use machines to make the first adjustments and use hand-held gauges to make final adjustments. This difference means the difference in investing in new machine capabilities or new gauging.
 - In some companies, the machine operator makes any conversions from metric to customary.
 - In other companies, one person is responsible for making all such conversions.

To deal with the costs of producing metric products, suppliers use several methods:

- Some allow the customer to pay the tooling costs -- the most measurement sensitive aspects of manufacturing;
- Others pay their own tooling costs so they can sell the products to other companies.
- Other companies, especially subcontractors, borrow tooling from the large manufacturers to make the product.

Fourth, small manufacturers see no exceptional problems or benefits from metric production (see Exhibit 19). Ninety percent of the companies saw no problems or benefits. Less than five percent saw some transitory problems such as lack of supplies, inconvenience, and a lack of standards across different manufacturers or industries. Less than five percent saw benefits, such as new domestic or foreign markets, or less competition. These problems and benefits are transitory. They disappear quickly.

Exhibit 19

EFFECTS ON METRIC MANUFACTURERS (continued)

● NO EXCEPTIONAL PROBLEMS
OR BENEFITS

Producing metric products presents no exceptional problems or benefits for small manufacturers.

- 90% SEE NO PROBLEMS
OR BENEFITS

Most see it as routine aspect of doing business; neither good nor bad - just necessary.

- LESS THAN 5% SEE
PROBLEMS

Problems include:

- inconvenience
- time spent converting and checking
- difficulty in getting metric supplies
- lack of standards among customers

- LESS THAN 5% SEE
BENEFITS

Benefits include:

- expand business with existing customers
- add new domestic or foreign customers
- less competition on metric orders

FINDINGS: RELATIONS AMONG LARGE AND SMALL BUSINESSES ON METRIC PRODUCTION

The third group of findings draws on the experiences of the case studies to clarify the nature of small and large business interaction on metric production.

First, small businesses make metric products for several customers, including large companies. (See Exhibit 20.) Metric accounted for an average of 10% to 51% of suppliers' total production for all customers. Looking at who they do their metric work for reveals few cases in which a single large company dominates a small supplier's metric business. Before the case studies the team thought a small supplier's metric business was dominated by one large corporate customer. At the one extreme, Ford accounts for an average of 43% of its small metric suppliers' metric production; at the other extreme, Ingersoll-Rand Portable Compressor accounts for 24% of its small suppliers' metric production. These small suppliers often sell metric products to other companies in the same industry as the large companies studied or to different industries. A few sell metric products to foreign companies.

Exhibit 20

RELATIONS AMONG LARGE AND SMALL BUSINESSES

• METRIC PRODUCTION FOR SEVERAL LARGE CORPORATIONS		Small manufacturers usually produce metric products for several large corporations.
AVERAGE PERCENT OF SUPPLIERS' PRODUCTION FOR ALL CUSTOMERS MAIN TO METRIC DIMENSIONS		
GE/DCPBD	37%	
FORD	51%	
INGERSOLL-RAND/IMPCO	19%	
INGERSOLL-RAND/ PORTABLE COMPRESSOR	14%	
INGERSOLL-RAND/POWER TOOL	15%	
AVERAGE PERCENT OF SUPPLIERS' METRIC PRODUCTION ACCOUNTED FOR BY THE LARGE COMPANY STUDIED		Metric sales to -- other companies in same industry -- other industries
GE/DCPBD	27%	
FORD	43%	
INGERSOLL-RAND/IMPCO	32%	
INGERSOLL-RAND/ PORTABLE COMPRESSOR	24%	
INGERSOLL-RAND/POWER TOOL	29%	

Second, small suppliers see their decision to make metric products as neither voluntary nor forced. (See Exhibit 21.) They do not see metric as the means to open new markets; they are not voluntarily seeking out metric work. However, business is business. If the customer wants metric, they are willing to produce it. They do not feel they have been forced to work in metric by any one company. They monitor the industry, and when demand is sufficient, they decide to work on metric orders. Very few companies see working to metric specifications as a major decision.

Exhibit 21

RELATIONS AMONG LARGE AND SMALL BUSINESSES (continued)

• NEITHER VOLUNTARY NOR FORCED

Small businesses see their metric production as neither voluntary nor forced.

- not a search for new business markets or other benefits
- not dictated by any one company
- a result of general industry trends

Third, metric production fits comfortably into established relations among large and small businesses. (See Exhibit 22.)

RELATIONS AMONG LARGE AND SMALL BUSINESSES (continued)

• FITS COMFORTABLY INTO ESTABLISHED RELATIONS	Metric fits comfortably into established relations among large manufacturers and their small suppliers.
- NO DROPOUTS	No suppliers were dropped as as result of conversion, according to the companies contacted.
- FEW ADDITIONS	A few distributors of metric hardware were added to large companies' supplier lists.
- INITIAL CONFUSION	Some initial confusion (6 months) - misread drawings - rejected parts - communications difficulties
- NO LASTING PROBLEMS	Now accepted as a routine aspect of doing business with large companies.



Small manufacturers consult with engineers, talk with purchasing people, work with quality assurance inspectors, and deal with service departments on metric products as they did with customary products. Some learned the new language faster than others. All learned to cope with metric relatively soon. None of the large companies studied dropped any of their suppliers as a result of their conversion to metric. They may have added a few distributors or manufacturers of standard metric hardware; e.g., fasteners. Quality problems have not increased on suppliers' products as a result of metric. The large companies do not care how the product is made as long as the quality is satisfactory.

CONCLUSION

The importance of small business in metric conversion has been highlighted repeatedly -- in Congressional reports on metric, in the language of the Metric Conversion Act of 1975, in the inclusion of small business representatives on

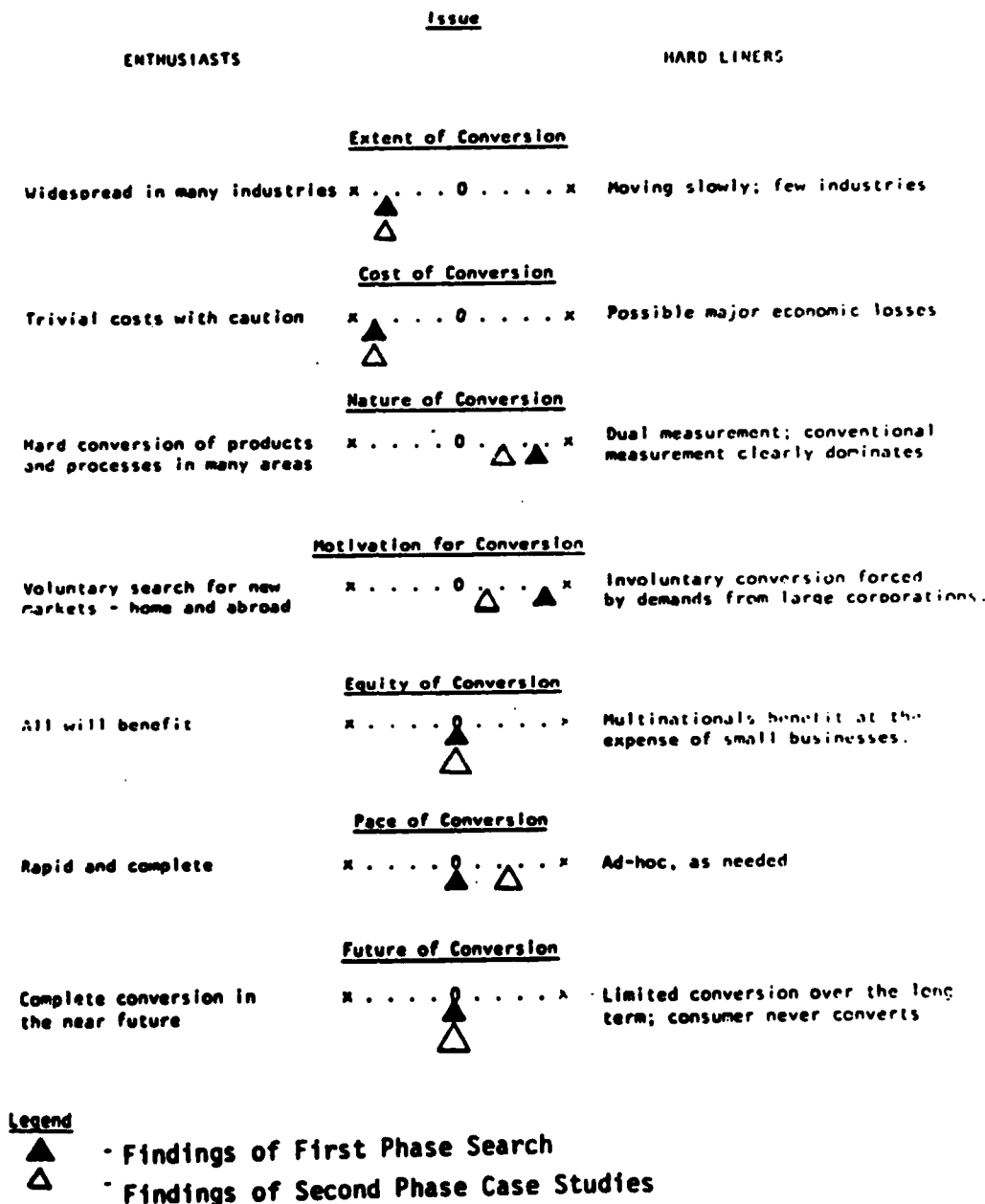
the U.S. Metric Board, and in the establishment of a Small Business Advisory Group of the American National Metric Council. The effect of conversion on small businesses has been a central concern in the metric debate. To characterize the past decade's debate, at one extreme stand the metric enthusiasts who see benefits to all in a rapid and complete shift to metric production. At the other extreme are the hard-line traditionalists who see little justification for metric conversion -- an unnecessary, non-competitive waste of resources. The findings of the first phase search and the second phase case studies have implications for the issues relating to:

- the extent of conversion;
- the cost of conversion;
- the nature of conversion;
- the motivation for conversion;
- the equity of conversion;
- the pace of conversion;
- the future of conversion.

Exhibit 23 shows the implications for the two phases of this project for the issues in the debate over the consequences of metric conversion for small manufacturers. The open dart () represents the findings from the three case studies; the closed dart () shows the implications of the search findings. The position of the darts indicates which pole of the controversy the findings from the research favor. For example, on costs of conversion the case studies and search darts are near the enthusiasts' position indicating that the research supports the view that costs of conversion are trivial.

The research indicates metric conversion is relatively widespread. Many of the companies contacted in the search use customary measurements to make metric parts. Among the suppliers to large companies, half use metric at some stage in making metric products. While the companies contacted in the search saw themselves forced by one or two customers to work in metric, suppliers to large companies see their metric work as a routine aspect of doing business -- neither voluntary nor forced. Large companies are benefiting from conversion through new international markets and more flexibility in production. However, the small manufacturers are not being harmed or helped by conversion. The

FINDINGS ON THE ISSUES CONCERNING
METRIC CONVERSION AND SMALL BUSINESSES



numerous industries converting to metric that appeared in the search indicate a relatively rapid conversion in American industry. The case studies indicate conversion, within industries, occurs on an ad hoc company-by-company basis. Finally, the future of conversion depends on the industry. Some industries, such as automobiles, will continue to convert rapidly; others, such as household appliances, are much less likely to convert.

The general conclusion is that metric is no big deal for small manufacturers. (See Exhibit 24.) Through extensive searches and detailed analyses of the complex relations among large and small businesses on metric, the research did not find hardship, suffering, or loss as a result of metric conversion. On the other hand, metric production has not created benefits or new opportunities for small manufacturers. It is a minor, routine aspect of doing business.

Exhibit 24

CONCLUSION

- METRIC PRODUCTION IS NO BIG DEAL
FOR SMALL MANUFACTURERS

IMPORTANT NOTE

There is some confusion about the role of the U.S. Metric Board and the national policy on metric conversion.

Congress established the Board to plan and coordinate the voluntary increasing use of the metric system. It is not, however, the role of the Board to promote metric usage.

The Board is an independent Federal agency responsible for conducting public information and education programs and appropriate research, coordination and planning activities.

Metric Conversion in this country is voluntary. When Congress passed the Metric Conversion Act in 1975 it did not make conversion mandatory; nor did it establish a target date or deadline for conversion.

The Board has no compulsory power. It is a public service agency consisting of citizen representatives from all walks of American life. Its 17 members are appointed by the President and confirmed by the Senate. Members are nominated to represent labor, retailing, small business, industry, construction, state and local governments, science, engineering, consumer groups and the public at large.

Please contact us if you have any questions about the role of the Board or the national policy on metric conversion.



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